

## 4.2 *Sample Weight Variations*

Samples fabricated in the field have a natural variability. Due to the specimen-to-specimen variability, statistical methods are used to determine if the weight of the mixtures or aggregate are similar or different. The statistical test chosen for this comparison is the equal variance two-tailed paired t-test, or analysis of variance (ANOVA). The null hypothesis is that the mixture or aggregate weights are the same. One challenge with using this method is that it determines significance based on the pooled variances of all the inputs. Some comparisons involve one set of data with low variability for one group and high variability for another. This difference means that some p-values are more precise than others. To compensate for this discrepancy, the variance was pooled for a given test method, e.g., the Vialit test. The variability of each group was taken into account by dividing each result by the standard deviation of the group (i.e., the modified z-test). The z-values were multiplied by the pooled standard deviation and added to the group mean. The t-test or ANOVA against the group number (two or three) was performed on the modified values (LaCroix et al. 2008).

Table 4-1 shows both the basic statistical analysis and a comparison with the ANOVA results. A significance level of 0.05 was used for the ANOVA test. From the ANOVA test results, as shown in Table 4-1, all the p-values for the F-test are larger than 0.05. Thus, no significant difference is evident in the sample weight per each test method for the three roller type groups.

Figure 4-2 plots the distribution of both mixture and aggregate weights to find an optimal roller type using the three different rollers. Figure 4-2 has three symbols, a filled symbol, an empty symbol, and a large empty circle symbol. The large empty circle symbol indicates the averages of the data for each roller type. The mixture weight is represented by the filled symbol, and the aggregate weight is represented by the empty symbol. The aggregate weight, as shown in Figure 4-2, was determined after the chip seal samples were burned in the ignition oven. The relatively small variations and close distribution of weights are shown in Figure 4-2.